Package 'Blendstat'

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Type Package

Title Joint Analysis of Experiments with Mixtures and Random Effects

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Description Performs a joint analysis of experiments with mixtures and random effects, taking on a process variable represented by a covariable.

License GPL-3

Encoding UTF-8

LazyData true

NeedsCompilation no

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Blendstat-package *Joint Analysis of Experiments with Mixtures and Random Effects.*

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Details

Package:	Blendstat
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References

Kalirajan, K. P. On the estimation of a regression model with fixed and random coefficients. *Journal of Applied Statistics*, 17(2): 237-244, 1990. doi:10.1080/757582835

Swany, P. A. V. B. *Statistical Inference in Random Coefficient Regression Models.* Amsterdam: Springer Science & Business Media, 1971. 209 p.

Blend *Joint analysis of experiments with mixtures and random effects.*

Description

Joint analysis of experiments with mixtures and random effects, taking on a process variable represented by a covariable.

Usage

```
Blend(exp, X, Y, conc = NULL, effects = NULL)
```

Arguments

exp	Vector with the names of the experiments.
X	Mixture variables (components), without the vector of the concentrations (covariable).
Y	Response variable.
conc	Vector with the concentrations (covariable) of the experiments.
effects	Vector of the effects of the mixtures in a reference mixture (example: centroid).

Value

MPred	Matrix with the predicted and observed values.
MCPred	Matrix with the values predicted by components.
Mexp	Matrix with the design of the experiments.
theta	Vector with the theta estimates.

Author(s)

Marcelo Angelo Cirillo

Paulo Cesar Ossani

References

Kalirajan, K. P. On the estimation of a regression model with fixed and random coefficients. *Journal of Applied Statistics*, 17(2): 237-244, 1990. doi:10.1080/757582835

Swany, P. A. V. B. *Statistical Inference in Random Coefficient Regression Models.* Amsterdam: Springer Science & Business Media, 1971. 209 p.

See Also

Plot.Blend

Examples

```
data(DataNAT) # dataset

Exp <- DataNAT[,2]   # identification of experiments

X <- DataNAT[,3:6] # independent variable
Y <- DataNAT[,11]  # dependent variable

# effects of the blends in a reference mixture
Effects <- rep(c(-0.1,0,0.1,0.2,0.3,0.4,0.5,0.6,0.7),4)

Conc <- as.matrix(DataNAT[,7]) # covariate (process variable)

Res <- Blend(exp = Exp, X = X, Y = Y, conc = Conc, effects = Effects)
```

```
print("Predicted and observed values"); Res$MPred
print("Values predicted by components:"); Res$MCPred
print("Design of the experiments:"); Res$Mexp
print("Estimates of the linear model parameters:"); Res$theta

Tit <- c("Covariate (process variable)","Variable")

Xlab = "effects"  # label of the X axis
Ylab = "Predicted values"  # label of the Y axis

Plot.Blend(Res, titles = Tit, posleg = 2, xlabel = Xlab,
           ylabel = Ylab, boxleg = TRUE, color = TRUE,
           expcolor = c("goldenrod3","gray53","red2", "blue2"),
           casc = TRUE)
```

DataCD *Dataset, peeled cherry coffee.*

Description

Database of coffee blends of different varieties processed via wet (peeled cherry).

Usage

```
data(DataCD)
```

Format

Database of coffee blends of different varieties processed via wet (peeled cherry). Formed by the variables: Exp (code of the experiments); CEB (specialty Bourbon Yellow coffee produced at an altitude above 1,200m); CT (roasted commercial coffee); CC (Conillon coffee); CEA (Acaia specialty coffee produced at altitude below 1,100m); Conc (concentrations at 7% and 10% (m/v) of roasted and ground coffee beans in 100 ml of water). Response variables defined by the sensorial attributes: Body, Taste, Acidity, Bitterness, Score.

References

Project yield and research entitled by "Quality of blends of specialty and non-specialty coffees of the region of the Mantiqueira Mountains - treatment of discrepant scores in tests with consumers". CNPq for their aid via grant number 304974/2015-3.

Examples

```
data(DataCD) # dataset

Exp <- DataCD[,2]   # identification of the experiments

X <- DataCD[,3:6] # independent variables (components)
```

```
Y <- DataCD[,11]  # dependent variable (response Bitterness)

# effects o the mixtures in the reference mixture
Effects <- rep(c(-0.1,0,0.1,0.2,0.3,0.4,0.5,0.6,0.7),4)

Conc <- as.matrix(DataCD[,7]) # covariable (process variable)

Res <- Blend(exp = Exp, X = X, Y = Y, conc = Conc, effects = Effects)

print("Predicted and observed values"); Res$MPred
print("Values predicted by components:"); Res$MCPred
print("Design of the experiments:"); Res$MExp
print("Estimates of the linear model parameters:"); Res$theta
```

DataNAT *Dataset, natural cherry coffee.*

Description

Database of coffee blends of different varieties processed by dry via.

Usage

```
data(DataNAT)
```

Format

Database of coffee blends of different varieties processed by dry via. Formed by the variables: Exp (code of the experiments); CEB (specialty Bourbon Yellow coffee produced at an altitude above 1,200m); CT (roasted commercial coffee); CC (Conillon coffee); CEA (Acaia specialty coffee produced at altitude below 1,100m); Conc (concentrations at 7% and 10% (w/v) of roasted and ground coffee beans in 100 ml of water). Variable responses defined by sensory attributes: Body, Taste, Acidity, Bitterness, Score.

References

Project yield and research entitled by "Quality of blends of specialty and non-specialty coffees of the region of the Mantiqueira Mountains - treatment of discrepant scores in tests with consumers". CNPq for their aid via grant number 304974/2015-3.

Examples

```
data(DataNAT) # dataset

Exp <- DataNAT[,2]   # identification of the experiments

X <- DataNAT[,3:6] # independent variables (components)
Y <- DataNAT[,11]  # dependent variable (response Bitterness)
```

```
# effects o the mixtures in the reference mixture
Effects <- rep(c(-0.1,0,0.1,0.2,0.3,0.4,0.5,0.6,0.7),4)

Conc <- as.matrix(DataNAT[,7]) # covariable (process variable)

Res <- Blend(exp = Exp, X = X, Y = Y, conc = Conc, effects = Effects)

print("Predicted and observed values"); Res$MPred
print("Values predicted by components:"); Res$MCPred
print("Design of the experiments:"); Res$MExp
print("Estimates of the linear model parameters:"); Res$Theta
```

`Plot.Blend` *Plots of the results.*

Description

Plots of the results of the joint analysis of the experiments.

Usage

```
Plot.Blend(BL, titles = c(NA,NA), posleg = 2, xlabel = NA,
           ylabel = NA, boxleg = FALSE, color = TRUE, expcolor = NA,
           casc = TRUE)
```

Arguments

`BL`	Data of the Blend function.
`titles`	Titles for the plot of the effects of the concentrations and components. If it is not defined, it assumes the default text.
`posleg`	1 for caption in the left upper corner, 2 for caption in the right upper corner (default), 3 for caption in the right lower corner, 4 for caption in the left lower corner.
`xlabel`	Names the X axis, if not set, assumes the default text.
`ylabel`	Names the Y axis, if not set, assumes the default text.
`boxleg`	Puts frame on the caption (default = TRUE).
`color`	Colorful plots (default = TRUE).
`expcolor`	Vector with the colors of the experiments.
`casc`	Cascade effect in the presentation of the plots (default = TRUE).

Value

Return several plots.

Author(s)

Marcelo Angelo Cirillo

Paulo Cesar Ossani

See Also

Blend

Examples

```
data(DataCD) # dataset

Exp <- DataCD[,2]   # identification of the experiments

X <- DataCD[,3:6] # independent variables (components)
Y <- DataCD[,11]  # dependent variable (response Bitterness)

# effects o the mixtures in the reference mixture
Effects <- rep(c(-0.1,0,0.1,0.2,0.3,0.4,0.5,0.6,0.7),4)

Conc <- as.matrix(DataCD[,7]) # covariable (process variable)

Res <- Blend(exp = Exp, X = X, Y = Y, conc = Conc, effects = Effects)

print("Predicted and observed values"); Res$MPred
print("Values predicted by components:"); Res$MCPred
print("Design of the experiments:"); Res$MExp
print("Estimates of the linear model parameters:"); Res$Theta

Tit <- c("Covariable (process variable)","Variable")

Xlab = "Effects"  # label of the X axis
Ylab = "Predicted values"  # label of the Y axis

Plot.Blend(Res, titles = Tit, posleg = 2, xlabel = Xlab,
           ylabel = Ylab, boxleg = TRUE, color = TRUE,
           expcolor = c("goldenrod3","gray53","red2", "blue2"),
           casc = TRUE)
```

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